AMENDMENTS TO THE SPECIFICATION

Please replace the paragraph beginning at line 29 on page 11 of the specification with the following:

(2) The modulators may be an acoustooptic modulator (AOM) or an eletrooptic modulator (EOM). Instead of using modulators, the modulation may be performed directly in the semiconductor laser device per se.

Please replace the bridging paragraph between pages 15 - 16 of the specification with the following:

Next, with reference to Figure 8 and Figure 9, the construction and operational principle of a GLV (Grating Light Valve) element that is to be employed as the optical modulating array element 46. The GLV element 201 is an SLM (Spatial Light Modulator) of a MEMS (Micro Electro Mechanical Systems) type, as disclosed in U.S. Patent 5,311,360, for example. As shown in Figure 8 [[6]], the GLV element 201 is constituted of a plurality of unidirectionally arranged gratings.

Please replace the paragraph beginning at line 6 on page 17 of the specification with the following:

In the case that a voltage is not applied to the micro bridges 209, all of the reflective surfaces thereof are matched in height, and no optical path difference arises in a light reflected thereby. On the other hand, if a voltage is applied to every other micro bridge 209, by the principle described above, the central portions of said micro bridges bend, and a reflective surface becomes alternately stepped. If a laser light is incident on this reflective surface, an optical path difference arises in the light reflected by the unbent micro bridges 209, and a

diffraction phenomenon of the light occurs. The intensity of the primary diffracted light first [[I1st]] depends on the optical path difference, and may be expressed by the equation below. In this case, the intensity of the diffracted light is maximal when the optical path difference is $\lambda/2$.

Please insert the following in the specification, beginning at line 24 on page 34, after the paragraph ending with "a laser light source 42 dedicated thereto":

An additional embodiment of the instant invention comprises a semiconductor laser element used as an excitation light source which emits laser light in the 360 nm band as excitation light. Fig. 18 is a cross-sectional view of the semiconductor laser. This semiconductor laser element used as an excitation light source is produced as follows.

Initially, an n-type GaN (0001) substrate 311 is formed in accordance with the method described in Japanese Journal of Applied Physics Part 2 Letters, vol. 37, 1998, pp. L1020. Then, an n-type $Ga_{1-z1}Al_{z1}N$/GaN superlattice cladding layer 312 (0<z1<1), and n-type or i-type (intrinsic) $Ga_{1-z2}Al_{z2}N$ optical waveguide layer 313 (z1>z2>0), a $Ga_{1z2}Al_{z2}N$ (doped with Si)/GaN multiple-quantum-well active layer 314, a p-type $Ga_{1-z3}Al_{z3}N$ carrier blocking layer 315 (0.5>z3>z3), an n-type or i-type $Ga_{1-z2}Al_{z2}N$ optical waveguide layer 316 (z1>z2>0), a p-type $Ga_{1-z1}Al_{z1}N$/GaN superlattice cladding layer 317 (0<z1<1), and a p-type GaN contact layer 318 are formed on the n-type GaN (0001) substrate 311 by organometallic vapor phase epitaxy. Thereafter, a SiO_2 insulation film 319 is formed over the p-type GaN contact layer 318, and a stripe area of the SiO_2 insulation film 319 having a width of about 100 μm is removed by normal lithography. Then, a p electrode 320 is formed over the SiO_2 insulation film 19 and the stripe area of the p-type GaN contact layer 318, the substrate 311 is polished, and an n electrode 321 is formed on the polished surface of the substrate 311. Finally, a resonator is formed by cleavage,

and a high reflectance coating and a low reflectance coating are provided on the respective end surfaces so as to form a resonator. Then, the construction of Fig. 18 is formed into a chip.

Fig. 19 is a cross-sectional view of a surface-emitting semiconductor element which is also used as part of the laser apparatus of an exemplary embodiment of the instant invention. The surface-emitting semiconductor element of Fig. 19 is excited with excitation laser light emitted from the semiconductor laser element of Fig. 18, and oscillates in a single transverse mode. The surface-emitting semiconductor element used as a part of the laser apparatus of an exemplary embodiment of the instant invention is produced as follows.

Initially, a superlattice distributed reflection film 332, a GaN optical confinement layer 333, and $In_{x2}Ga_{1-x2}N/In_{x3}Ga_{1-x3}N$ multiple-quantum-well active layer 334 ($0<x2<x3<0.5$), a GaN optical confinement layer 335, and an $Al_{z4}Ga_{1-z4}N$ layer 336 ($0<z4<0.5$) are formed on a GaN (0001) substrate 331 by organometallic vapor phase epitaxy, where the superlattice distributed reflection film 332 is comprised of 20 pairs of AlN and GaN layers, the GaN layer in each pair has a thickness of $\lambda/4n_{GaN}$, the AlN layer in each pair has a thickness of $\lambda/4n_{AlN}$, λ is an oscillation wavelength of the surface-emitting semiconductor element of Fig. 19, and N_{GaN} and N_{AlN} are the refractive indexes of GaN and IlN at the oscillation wavelength λ, respectively. Next, a ZrO_2 antireflection coating 337 having a thickness of $\lambda/4n_{Zro2}$ is formed over the construction layered as above, by electron beam evaporation, where n_{Zro2} is the refractive index of Zro2 at the oscillation wavelength λ. Thereafter, the substrate 331 is polished, and the layered structure formed as above is cleaved, and further formed into a chip.

The wavelength λ of light emitted by the surface-emitting semiconductor element 338 of Fig. 19 can be controlled in the range between 380 and 560 nm by appropriately adjusting the composition of the $In_{x3}Ga_{1-x3}N$ multiple-quantum-well active layer 334.

In order to sufficiently absorb the excitation laser light, it is preferable that the number of quantum wells in the multiple-quantum-well active layer 334 is 20 or more, and it is further preferable that the number of quantum wells is about 24 since the surface-emitting semiconductor element 338 is prone to crack due to excessive thickness when the number of the quantum wells exceeds 24.

Fig. 20 is a diagram illustrating a further embodiment of the instant invention. The laser apparatus of Fig. 20 comprises the semiconductor laser element 324 (for example, the semiconductor element 324 as shown in Fig. 18) as the excitation light source, the surface-emitting semiconductor element 338 (for example, the surface-emitting semiconductor element 338 as shown in Fig. 19) bonded to a heatsink 343 at the surface of the substrate 331, a concave mirror 346 as an output mirror, a resonator 349 formed by a concave surface of the concave mirror 346 and the superlattice distributed reflection film 332 of the surface-emitting semiconductor element 338, and a Brewster plate 345 arranged in the resonator 349. The Brewster plate 345 controls polarization.

In the construction of the device of Fig. 20, excitation laser light 347 emitted from the semiconductor laser element 324 is collected by the lens 342 into the semiconductor layers of the surface-emitting semiconductor element 338, and excites the surface-emitting semiconductor element 338. Then, light emitted by the surface-emitting semiconductor element 338 resonates in the resonator 349, and laser light 348 exits from the output mirror 346.

Since the GaN substrate 331 of the surface-emitting semiconductor element 338 is not transparent to the excitation laser light 347 emitted from the semiconductor laser element 324, the surface-emitting semiconductor element 338 is excited with the excitation laser light 347 from the lateral side of the surface-emitting semiconductor element 338, as illustrated in Fig. 20.

The laser apparatus of Fig. 20 has the following advantages.

(a) Since the thermal conductivity of the GaN substrate 331 is great, heat dissipation of the surface-emitting semiconductor element 338 is easy when the surface-emitting semiconductor element 338 is bonded to the heatsink 343 at the surface of the GaN substrate 331 as illustrated in Fig. 20. In addition, beam deformation due to the thermal lens effect is very small in surface-emitting semiconductor elements. Therefore, the laser apparatus of Fig. 20 can achieve higher output power than the conventional laser apparatuses using semiconductor laser elements.

(b) High speed modulation of the output laser light of the laser apparatus of Fig. 20 can be achieved by directly modulating the semiconductor laser element 324, while high speed modulation is difficult in the conventional solid-state laser.

(c) Since the semiconductor laser elements 324 can be a broad area type semiconductor laser element as described with reference to Fig. 18, the semiconductor laser element 324 can emit laser light with high output power (e.g., 1 to 10 watts). Therefore, the output power of the laser apparatus of Fig. 3 can be hundreds of milliwatts to several watts.

(d) The surface-emitting semiconductor element 338 is excited with light, and is therefore different from the usual semiconductor laser elements driven by current injection, in that the surface-emitting semiconductor element 338 is free from the problem of deterioration

with elapse of time due to short-circuit currents caused by diffusion of dopants such as magnesium. Thus, the lifetime of the laser apparatus of Fig. 20 is long.

Please insert the following in the specification, beginning at line 9 on page 7, prior to the heading "Description of Preferred Embodiments":

Fig. 18 is a sectional view illustrating a further embodiment of the instant invention.

Fig. 19 is a further sectional view illustrating another embodiment of the instant invention.

Fig. 20 is yet an additional sectional view illustrating a further embodiment of the instant invention.